



EFFECT OF SULFATE CONCENTRATION IN THE WASTEWATER ON MICROBIAL FUEL CELL PERFORMANCE

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Abstract

The effect of presence of sulfate in wastewater on the wastewater treatment efficiency and electricity harvesting capacity of microbial fuel cell (MFC) has been studied in two identical dual chambered MFCs (MFC-1 and MFC-2) at different COD/SO₄²⁻ ratio in synthetic wastewater with sucrose as a carbon source. The MFCs were operated under batch mode at feed cycle time of 48 h. Performance of MFC-1 was evaluated under different COD/SO₄²⁻ ratio of 500, 20, 1, 0.8, 0.5, and 0.3. To understand the reproducibility of the results, experiments with certain COD/SO₄²⁻ ratio in the feed (20, 1, 0.5, and 0.3) were repeated in the MFC-2. Increase in COD removal and power production was observed with decrease in COD/SO₄²⁻ ratio up to 0.8 in the wastewater. Both the MFCs demonstrated similar performances when operated at the similar COD/SO₄²⁻ ratio. Increase in COD removal and power production was observed with decrease in COD/SO₄²⁻ ratio up to 0.8 in the wastewater. MFC-1 demonstrated highest COD removal efficiency of 79% and power density and volumetric power of 97.2 mW/m² and 1136.8 mW/m³, respectively, at the COD/SO₄²⁻ ratio of 0.8. The highest Coulombic efficiency and energetic efficiency were 7.36% and 15.69%, respectively, in MFC-1 at the COD/SO₄²⁻ ratio of 0.8. Deterioration in reactor performance was observed when the COD/SO₄²⁻ ratio was decreased below 0.8.

Key words: COD/SO₄²⁻ ratio, Coulombic efficiency, microbial fuel cell, power density, sulfate reduction

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